



Northern States Power Company

414 Nicollet Mall
Minneapolis, Minnesota 55401
Telephone (612) 330-5500

January 26, 1988

IE Bulletin 87-02

Director of Nuclear Reactor Regulation
U S Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket Nos. 50-282 License Nos. DPR-42
50-306 DPR-60

Response to NRC Compliance Bulletin 87-02

Attached is our response to NRC Compliance Bulletin 87-02 dated November 6, 1987. A two-week extension in the 60-day response required by the Bulletin was authorized by the NRR Project Manager for Prairie Island.

As noted in the attached response, material and chemical tests of all safety related and non-safety related fasteners were within specifications with the exception of four non-safety related hardness tests. These deviations in hardness values appeared to be within expected measurement variances for hardness testing and are judged to have no effect on service performance.

Please contact us if you have any questions related to the information we have provided.

C E Larson
Vice President Nuclear Generation

c: Regional Administrator, Region III, NRC
Sr Resident Inspector, NRC
NRR Project Manager, NRC
G Charnoff

Attachment

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UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

DOCKET NO. 50-282
50-306

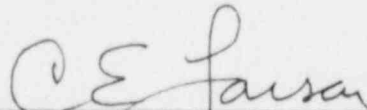
RESPONSE TO NRC COMPLIANCE BULLETIN 87-02

Northern States Power Company, a Minnesota corporation, with this letter is submitting information requested by NRC Compliance Bulletin 87-02.

This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY

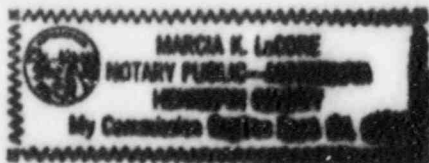
By



C E Larson

Vice President Nuclear Generation

On this 26th day of January, 1988 before me a notary public in and for said County, personally appeared C E Larson, Vice President Nuclear Generation, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of Northern States Power Company, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true and that it is not interposed for delay.



I BULLETIN ACTION ITEM 1

DESCRIPTION OF FASTENER PROCUREMENT, STORAGE AND
ISSUANCE CONTROLS

A. Procurement

Fasteners are procured as either safety or non safety related.

Safety related fasteners are procured to meet original or engineered specifications using current material and testing standards.

In many cases safety related fasteners are ordered by part number from original equipment vendors and required to meet original specifications. These fasteners have a specific use.

In other cases safety related fasteners are ordered to a specific material standard (e.g. ASTM A193 Gr B7) and quality requirements (such as need for C of C, CMTR, NDE or QA approved vendor). These standards and quality requirements meet original specifications and applicable code requirements. As shown on the Fastener Testing Data Sheets these requirements can range from CMTRs from QA approved vendors to commercial grade from non QA approved vendors depending on end use of the fastener. These fasteners may have a specific use or may be intended for a variety of uses.

Non safety related fasteners are procured from non QA approved vendors by part number from equipment manufacturers or to applicable equipment (or end use) standards. These fasteners may have a specific use or may be intended for a variety of uses.

B. Receipt Inspection

Warehouse personnel receive all fastener shipments and assure no shipping damage and that correct items are received. Safety related fasteners are then placed "on hold" for QC receipt inspection.

QC receipt inspection is conducted on safety related fasteners by certified inspectors in accordance with QC administrative controls and checklists which assure that:

Fasteners are obtained from approved vendors if required by PO.

Inspections for damage, cleanliness, size and required head marking are conducted. For large shipments standard sampling techniques are used.

Certifications and tests (as required by PO such as C of C, CMTR or NDE) are acceptable.

Other specific inspection requirements as applied by engineering are conducted.

C. Storage and Issuance Controls

Fasteners which are safety related are segregated from non safety related fasteners by compartment location and tagging. Fasteners may be located in either the main plant warehouse or the construction (plant construction dept. projects) warehouse but the methods of storage and segregation are essentially the same. Some non safety related fasteners are kept in the plant maintenance shop area and are to be used only for non safety related general use.

Issuance of fasteners from warehouses requires a stores requisition (typically an approved work request package) which specifies QA class (safety related or not), fastener type and often times the specific warehouse tag identification (PO or project number). Warehouse personnel are required to only issue material as specified in the stores requisition. In some cases of maintenance repair, fastener types may not initially be specified on work packages due to unexpected need for replacements identified during conduct of work. Plant directives require the work request responsible individual (normally the system engineer) to be contacted and authorize such changes in work scope for safety related work. Plant administrative controls also require responsible individuals to verify that the correct type, grade and class of parts are used before signing the post review (before release for operation) on safety related work requests.

It is also important to note that maintenance and construction personnel are aware of requirements for parts use and that engineer, QC and QA field involvement emphasizes application of correct class and pedigree of fasteners.

II BULLETIN ACTION ITEMS 2 AND 3

FASTENER SAMPLING

Fasteners were sampled in accordance with Bulletin 87-02 requirements with the participation of site NRC Resident Inspector. Four externally threaded fasteners (two safety related and two non safety related) did not have corresponding nuts due to their use as cap screws or similar application. Therefore a total of 36 fasteners were sampled, twenty studs/bolts and sixteen nuts. Refer to the Fastener Testing Data Sheets for details on each fastener sampled.

Sample ID numbers are described as follows:

PIXY-SR

PI - Prairie Island

X - "B" for bolt/cap screw or "S" for stud or "N" for nut

Y - Sequential number for each fastener set

The suffix "SR" is used only for safety related fasteners

III BULLETIN ACTION ITEM 4

TESTING

Fasteners were tested in accordance with the requirements of Bulletin 87-02 and the applicable material specifications. All fasteners were tested for chemical content and hardness. Please note that in some cases hardness requirements do not exist in the material specifications, namely for A193 Grades B7 and B16 bolts/studs and A194 Grade 8 strain hardened nuts (These were tested and results were as expected for material, heat treatment and corresponding nut/bolt).

Safety related externally threaded fasteners were also tension tested. As noted in the attached test report, slight variance was necessary to permit tensile testing of PIB2-SR since the length was too short to obtain a yield strength value. All test results on this bolt, including tensile properties, were fully acceptable.

IV BULLETIN ACTION ITEM 5

TEST RESULTS

Results of testing are shown in the attached test report from Twin City Testing Corporation (TCT). Chemical analysis results and specification requirements begin on page 4. Tensile test results and specification requirements begin on page 8. Hardness test results and specification requirements begin on page 11.

SAFETY RELATED

All safety related fasteners met specification requirements.

NON SAFETY RELATED

All non safety related fasteners met chemistry requirements.

Four non safety related fasteners were slightly out of specification ranges for hardness as shown on TCT report page 14. However, the hardness values are all within 1.5 hardness measurement units of that required except for the bolt head surface test on PI-B1. PI-B1 was retested after removal of 1/32 inch of material on the shank and found to be within specification. Although samples PI-B1, B3, and B10 do not have minimum hardness requirements per SAE J429 Table 3, the minimum values from J429 Table 1 were used to compare with equivalent tensile strength since tensile tests were not required by the bulletin.

The slight deviations in hardness values are apparently not unusual due to the statistical nature of fastener manufacture and control. These results seem to be within expected measurement variances for hardness testing and should have no effect on service performance. Because these deviations were for non safety related fasteners and because values are well within engineering safety factors and tolerances, no safety significance or equipment functional concerns exist.

V BULLETIN ACTION ITEM 6

FURTHER ACTIONS

It is apparent that Prairie Island has not identified any "counterfeit" or incorrectly marked fasteners through this sampling program. Sampling results show that existing procedures and administrative requirements are adequate to control the use of fasteners at Prairie Island. Information regarding the concerns expressed in this bulletin and results of testing will be distributed to appropriate plant personnel.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIS1-SR

FASTENER DESCRIPTION AND SIZE (in) : stud .875x6

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A193 B16

HEAD MARKING - SPEC/GRADE : NB16

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Apollo Piping Supply *
2750 N Ranchview, Plymouth, Mn 55447

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE : G.A. Rolfsen 1-15-88
G.A. Rolfsen Date

NOTES .

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

Blank fields indicate that information does not exist or is not known.

4) * indicates that specificat.on was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN1-SR

FASTENER DESCRIPTION AND SIZE (in) : nut .875

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A194 2H

HEAD MARKING - SPEC/GRADE : 2H

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Apollo Piping Supply *
2750 N Ranchview, Plymouth, Mn 55447

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE : G.A. Rolfsen 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PPAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB2-SR

FASTENER DESCRIPTION AND SIZE (in) : bolt 1.25x5

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A193 B7

HLAD MARKING - SPEC/GRADE : B7

HEAD MARKING - MANUFACTURER : V

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Victor Products Corp.*
2635 Belmont Ave, Chicago, Ill 60618

QA REQUIREMENTS IMPOSED ON VENDOR : AVCMTR

LICENSEE REPRESENTATIVE : G.A. Rolfsen 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PPAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : FIS3-SR

FASTENER DESCRIPTION AND SIZE (in) : stud .75x4.25

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A193 B7

HEAD MARKING - SPEC/GRADE : B7

HEAD MARKING - MANUFACTURER : C

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOG

LICENSEE REPRESENTATIVE : _____

G.A.Rolfson

1-15-88

Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOG - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN3-SR

FASTENER DESCRIPTION AND SIZE (in) : nut .75

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A194 2H

HEAD MARKING - SPEC/GRADE : 2H

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE : G.A. Rolfsen 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIS4-SR

FASTENER DESCRIPTION AND SIZE (in) : stud .875x5.5

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A193 B7

HEAD MARKING - SPEC/GRADE : B7

HEAD MARKING - MANUFACTURER : C

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE : G.A. Roifson 1-15-88
Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN4-SR

FASTENER DESCRIPTION AND SIZE (in) : nut .875

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A194 2H

HEAD MARKING - SPEC/GRADE : 2H

HEAD MARKING - MANUFACTURER : C

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB5-SR

FASTENER DESCRIPTION AND SIZE (in) : bolt .375x1

SAMPLE STOCK LOCATION : Construction Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : KS

PROCUREMENT LEVEL : SRCG

GENERAL PLANT APPLICATION : Elec. Cabs., Brackets, etc.

VENDOR : Commonwealth Electric
554 Broadway, St.Paul, Mn 55101

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : G.A. Rolfson 1-15-88
G.A. Rolfson Date

NOTES :

- 1) Procurement Level Description :
 - NSR - Non Safety Related
 - SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.
 - SRCG - Safety Related commercial grade purchase order.
- 2) QA Requirements Description :
 - AVCOC - Approved vendor, C of C required.
 - AVCMTR - Approved vendor, CMTR required.
- 3) Blank fields indicate that information does not exist or is not known.
- 4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN5-SR

FASTENER DESCRIPTION AND SIZE (in) : nut .375

SAMPLE STOCK LOCATION : Construction Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A563 A

HEAD MARKING - SPEC/GRADE : none

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : SRCG

GENERAL PLANT APPLICATION : Elec. Cabs., Brackets, etc.

VENDOR : Commonwealth Electric
554 Broadway, St. Paul, Mn 55101

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* 1-15-88
G.A. Rolfson Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB6-SR

FASTENER DESCRIPTION AND SIZE (in) : bolt .5x2

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : A

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : Elec. Supports/Brackets

VENDOR : Unistrut Northern
721 NE Harding, St. Paul, Mn 55413

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB7-SR

FASTENER DESCRIPTION AND SIZE (in) : bolt .75x2.5

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A325 1

HEAD MARKING - SPEC/GRADE : A325

HEAD MARKING - MANUFACTURER : UNY

PROCUREMENT LEVEL : SRCG

GENERAL PLANT APPLICATION : Limited Structural

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* *1-15-88*
G.A. Rolfson Date

NOTES :

- 1) Procurement Level Description :
 - NSR - Non Safety Related
 - SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.
 - SRCG - Safety Related commercial grade purchase order.
- 2) QA Requirements Description :
 - AVCOC - Approved vendor, C of C required.
 - AVCMTR - Approved vendor, CMTR required.
- 3) Blank fields indicate that information does not exist or is not known.
- 4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN7-SR

FASTENER DESCRIPTION AND SIZE (in) : nut .75

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A194 2H

HEAD MARKING - SPEC/GRADE : 2H

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : SRCG

GENERAL PLANT APPLICATION : Limited Structural

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE :

G.A. Rolison
G.A. Rolison

1-15-88
Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB8-SR

FASTENER DESCRIPTION AND SIZE (in) : bolt .875x3

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A325 1

HEAD MARKING - SPEC/GRADE : A325

HEAD MARKING - MANUFACTURER : CM-1

PROCUREMENT LEVEL : SRCG

GENERAL PLANT APPLICATION : Limited Structural

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolifson* *1-15-88*
G.A. Rolifson Date

NOTES :

- 1) Procurement Level Description :
 - NSR - Non Safety Related
 - SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.
 - SRCG - Safety Related commercial grade purchase order.
- 2) QA Requirements Description :
 - AVCOC - Approved vendor, C of C required.
 - AVCMTR - Approved vendor, CMTR required.
- 3) Blank fields indicate that information does not exist or is not known.
- 4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN8-SR

FASTENER DESCRIPTION AND SIZE (in) : nut .875

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A194 2H

HEAD MARKING - SPEC/GRADE : 2H

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : SRCG

GENERAL PLANT APPLICATION : Limited Structural

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : G.A. Rolfsen 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIS9-SR

FASTENER DESCRIPTION AND SIZE (in) : stud .625x5

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A193 B8,C1.2,SH

HEAD MARKING - SPEC/GRADE : B8

HEAD MARKING - MANUFACTURER : C

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE :

G.A. Rolfsen
G.A. Rolfsen

1-15-88
Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN9-SR

FASTENER DESCRIPTION AND SIZE (in) : nut .625

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A194 8SH

HEAD MARKING - SPEC/GRADE : 8B

HEAD MARKING - MANUFACTURER : C

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE :

G.A. Rolfsen
G.A. Rolfsen

1-15-88
Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIS10-SR

FASTENER DESCRIPTION AND SIZE (in) : stud .625x6

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A193 B7

HEAD MARKING - SPEC/GRADE : B7

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE :

G.A. Rolfson
G.A. Rolfson

1-15-88
Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN10-SR

FASTENER DESCRIPTION AND SIZE (in) : nut .625

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A194 2H

HEAD MARKING - SPEC/GRADE : 2H

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : SRAV

GENERAL PLANT APPLICATION : PBoundary

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : AVCOC

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* *1-15-88*
G.A. Rolfsen Date

NOTES :

- 1) Procurement Level Description :
 - NSR - Non Safety Related
 - SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.
 - SRCG - Safety Related commercial grade purchase order.
- 2) QA Requirements Description :
 - AVCOC - Approved vendor, C of C required.
 - AVCMTR - Approved vendor, CMTR required.
- 3) Blank fields indicate that information does not exist or is not known.
- 4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB1

FASTENER DESCRIPTION AND SIZE (in) : bolt .75x4.5

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : *SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : J

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Clg. Twr. Mech. Vdr. Supplied

VENDOR : Eccodyne
Mercantile Plaza, St. Charles, Ill 60174

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : G.A. Rolfsen 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB2

FASTENER DESCRIPTION AND SIZE (in) : bolt 1.25x4

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : *SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : S B C

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Turbine Eqmt. Vdr. Supplied

VENDOR : Westinghouse Electric Corp.
3501 S Hiway 100, Mpls, MN 55416

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN2

FASTENER DESCRIPTION AND SIZE (in) : nut 1.25

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A194 2H

HEAD MARKING - SPEC/GRADE : 2H

HEAD MARKING - MANUFACTURER : P

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Turbine Eqmt. Vdr. Supplied

VENDOR : Westinghouse Electric Corp.
3501 S Hiway 100, Mpls, MN 55416

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

- 1) Procurement Level Description :
 - NSR - Non Safety Related
 - SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.
 - SRCG - Safety Related commercial grade purchase order.
- 2) QA Requirements Description :
 - AVCOC - Approved vendor, C of C required.
 - AVCMTR - Approved vendor, CMTR required.
- 3) Blank fields indicate that information does not exist or is not known.
- 4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB3

FASTENER DESCRIPTION AND SIZE (in) : bolt 1.5x6.5

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : *SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : Erie

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : RCP Mtr. Strg. Stnd. Vdr. Supplied

VENDOR : Westinghouse Electric Corp.
3501 S Hiway 100, Mpls, MN 55416

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* *1-15-88*
G.A. Rolfson Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB4

FASTENER DESCRIPTION AND SIZE (in) : bolt 1x2.75

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A193 B7

HEAD MARKING - SPEC/GRADE : B7

HEAD MARKING - MANUFACTURER : TB

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Turbine Eqmt.

VENDOR : Cardinal Industrial Products Corp.
3873 W Oquendo, Las Vegas, NV 89119

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* 1-15-88
G.A. Rolfson Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN4

FASTENER DESCRIPTION AND SIZE (in) : nut 1

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : ASTM A194 2H

HEAD MARKING - SPEC/GRADE : 2H

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Turbine Eqmt.

VENDOR : Apollo Piping Supply
2750 N Ranchview, Plymouth, Mn 55447

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* 1-15-88
G.A. Rolfson Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB5

FASTENER DESCRIPTION AND SIZE (in) : bolt .75x3.5

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A325 1

HEAD MARKING - SPEC/GRADE : A325

HEAD MARKING - MANUFACTURER : A S

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Clg. Twr. Mech. Vdr. Supplied

VENDOR : Ecodyne (Custodis)
Mercantile Plaza, St. Charles, Ill 60174

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolison* 1-15-88
G.A. Rolison Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN5

FASTENER DESCRIPTION AND SIZE (in) : nut .75

SAMPLE STOCK LOCATION : Plant Warehouse

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A563 C

HEAD MARKING - SPEC/GRADE : (Gr.C Symbol)

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Clg. Twr. Mech. Vdr. Supplied

VENDOR : Ecodyne (Custodis)
Mercantile Plaza, St. Charles, Ill 60174

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

- 1) Procurement Level Description :
 - NSR - Non Safety Related
 - SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.
 - SRCG - Safety Related commercial grade purchase order.
- 2) QA Requirements Description :
 - AVCOC - Approved vendor, C of C required.
 - AVCMTR - Approved vendor, CMTR required.
- 3) Blank fields indicate that information does not exist or is not known.
- 4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB6

FASTENER DESCRIPTION AND SIZE (in) : bolt .675x2

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : (delta)

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Pheoll Mfgr.
1313 Chestnut Ave. N, Mpls, MN 55403

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : G.A. Rolfsen 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

A C C - Approved vendor, C of C required.

A C R - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PINS

FASTENER DESCRIPTION AND SIZE (in) : nut .675

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A563 A

HEAD MARKING - SPEC/GRADE : none

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Pheoll Mfgr.
1313 Chestnut Ave. N, Mpls, MN 55403

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

- 1) Procurement Level Description :
 - NSR - Non Safety Related
 - SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.
 - SRCG - Safety Related commercial grade purchase order.
- 2) QA Requirements Description :
 - AVCOC - Approved vendor, C of C required.
 - AVCMTR - Approved vendor, CMTR required.
- 3) Blank fields indicate that information does not exist or is not known.
- 4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB7

FASTENER DESCRIPTION AND SIZE (in) : bolt .5x6

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : FM

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Pheoll Mfgr.
1313 Chestnut Ave. N, Mpls, MN 55403

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolifson* 1-15-88
G.A. Rolifson Date

NOTES :

- 1) Procurement Level Description :
 - NSR - Non Safety Related
 - SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.
 - SRCG - Safety Related commercial grade purchase order.
- 2) QA Requirements Description :
 - AVCOC - Approved vendor, C of C required.
 - AVCMTR - Approved vendor, CMTR required.
- 3) Blank fields indicate that information does not exist or is not known.
- 4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN7

FASTENER DESCRIPTION AND SIZE (in) : nut .5

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A563 A

HEAD MARKING - SPEC/GRADE : none

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Pheoll Mfgr.
1313 Chestnut Ave. N, Mpls, MN 55403

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* 1-15-88
G.A. Rolfson Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB8

FASTENER DESCRIPTION AND SIZE (in) : bolt .875x5

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : N.F.

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Pheoll Mfgr.
1313 Chestnut Ave. N, Mpls, MN 55403

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* 1-15-88
G.A. Rolfson Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN8

FASTENER DESCRIPTION AND SIZE (in) : nut .875

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A563 A

HEAD MARKING - SPEC/GRADE : none

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Pheoll Mfgr.
1313 Chestnut Ave. N, Mpls, MN 55403

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* 1-15-88
G.A. Rolfson Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB9

FASTENER DESCRIPTION AND SIZE (in) : bolt .75x4

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol) .

HEAD MARKING - MANUFACTURER : M.V.

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Vincent Brass & Alum.
200 24th Ave SE, Mpls, Mn 55414

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor. C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN9

FASTENER DESCRIPTION AND SIZE (in) : nut .75

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A563 A

HEAD MARKING - SPEC/GRADE : none

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Pheoll Mfgr.
1313 Chestnut Ave. N, Mpls, MN 55403

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfson* 1-15-88
G.A. Rolfson Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

PRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIB10

FASTENER DESCRIPTION AND SIZE (in) : bolt 1x3

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : SAE J429 5

HEAD MARKING - SPEC/GRADE : (Gr.5 Symbol)

HEAD MARKING - MANUFACTURER : TV

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Vincent Brass & Alum.
200 24th Ave SE, Mpls, Mn 55414

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.

FRAIRIE ISLAND GENERATING PLANT
FASTENER TESTING DATA SHEET

SAMPLE ID # : PIN10

FASTENER DESCRIPTION AND SIZE (in) : nut 1

SAMPLE STOCK LOCATION : Maintenance Shop Storage

MATERIAL SPECIFICATION PER DOCUMENTATION : *ASTM A563 A

HEAD MARKING - SPEC/GRADE : none

HEAD MARKING - MANUFACTURER :

PROCUREMENT LEVEL : NSR

GENERAL PLANT APPLICATION : Gen. Maint. Use, NSR

VENDOR : Vincent Brass & Alum.
200 24th Ave SE, Mpls, Mn 55414

QA REQUIREMENTS IMPOSED ON VENDOR : none

LICENSEE REPRESENTATIVE : *G.A. Rolfsen* 1-15-88
G.A. Rolfsen Date

NOTES :

1) Procurement Level Description :

NSR - Non Safety Related

SRAV - Safety Related purchase order requiring QA approved vendor for product and C of C or CMTR.

SRCG - Safety Related commercial grade purchase order.

2) QA Requirements Description :

AVCOC - Approved vendor, C of C required.

AVCMTR - Approved vendor, CMTR required.

3) Blank fields indicate that information does not exist or is not known.

4) * indicates that specification was determined indirectly from marking or other means.



662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

RECEIVED OF: CHEMICAL ANALYSIS, TENSILE TEST, AND HARDNESS EVALUATION OF FASTENERS
 PROJECT: MATERIAL EVALUATION DATE: January 8, 1988
PRAIRIE ISLAND NUCLEAR PLANT
 REPORTED TO: Northern States Power Company cc: 1-Northern States Power Co
 Prairie Island Nuclear Generating Plant Attn: Donald J Brosche
 Attn: Gregory A Rolfson
 1717 Wakonade Drive East
 Welch, MN 55089

LABORATORY No. 4142 88-0337

PURCHASE ORDER NO. E-53419HQ

GENERAL:

On December 10, 1987, thirty-six fasteners were received from Northern States Power Company's Prairie Island Nuclear Generating Plant, located in Welch, Minnesota. The fasteners were identified as follows:

Safety Related Fasteners -

<u>Sample Identification</u>	<u>Sample Description</u>	<u>Material Specification</u>	<u>Testing To be Performed</u>
PIS1-SR	7/8"-9 UNC x 6" long stud	ASTM:A193, Grade B16	Tensile/Chemical/Hardness
PIN1-SR	7/8"-9 UNC hex nut	ASTM:A194, Grade 2H	Chemical/Hardness
PIB2-SR	1 1/4"-7 UNC x 5" long hex head cap screw	ASTM:A193, Grade B7	Tensile/Chemical/Hardness
PIS3-SR	3/4"-10 UNC x 4 1/4" long stud	ASTM:A193, Grade B7	Tensile/Chemical/Hardness
PIN3-SR	3/4"-10 UNC hex nut	ASTM:A194, Grade 2H	Chemical/Hardness
PIS4-SR	7/8"-9 UNC x 5 1/2" long stud	ASTM:A193, Grade B7	Tensile/Chemical/Hardness
PIN4-SR	7/8"-9 UNC hex nut	ASTM:A194, Grade 2H	Chemical/Hardness
PIB5-SR	3/8"-16 UNC x 1" long hex bolt	SAE:J429, Grade 5	Tensile/Chemical/Hardness
PIN5-SR	3/8"-16 UNC plated hex nut	ASTM:A563, Grade A	Chemical/Hardness
PIB6-SR	1/2"-13 UNC x 2" long plated hex bolt	SAE:J429, Grade 5	Tensile/Chemical/Hardness



twin city testing
corporation

662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSIS, TENSILE TEST, AND HARDNESS EVALUATION OF FASTENERS

LABORATORY No. 4142 88-0337

DATE: January 8, 1988

PAGE: Two

GENERAL: (cont)

Safety Related Fasteners - (cont)

<u>Sample Identification</u>	<u>Sample Description</u>	<u>Material Specification</u>	<u>Testing to be Performed</u>
PIB7-SR	3/4"-10 UNC x 2 1/2" long hex bolt	ASTM:A325, Type 1	Tensile/Chemical/Hardness
PIN7-SR	3/4"-10 UNC hex nut	ASTM:A194, Grade 2H	Chemical/Hardness
PIB8-SR	7/8"-9 UNC x 3" long hex bolt	ASTM:A325, Type 1	Tensile/Chemical/Hardness
PIN8-SR	7/8"-9 UNC hex nut	ASTM:A194, Grade 2H	Chemical/Hardness
PIS9-SR	5/8"-11 UNC x 5" long stain hardened stud	ASTM:A193, Class 2, Grade B8	Tensile/Chemical/Hardness
PIN9-SR	5/8"-11 UNC hex nut	ASTM:A194, Grade 8	Chemical/Hardness
PIS10-SR	5/8"-11 UNC x 6" long stud	ASTM:A193, Grade B7	Tensile/Chemical/Hardness
PIN10-SR	5/8"-11 UNC hex nut	ASTM:A194, Grade 2H	Chemical/Hardness

Non-Safety Related Fasteners -

<u>Sample Identification</u>	<u>Sample Description</u>	<u>Material Specification</u>	<u>Testing to be Performed</u>
PIB1	3/4"-10 UNC x 4 1/2" long plated hex bolt	SAE:J429, Grade 5	Chemical/Hardness
PIB2	1 1/4"-7 UNC x 4" long hex bolt	SAE:J429, Grade 5	Chemical/Hardness
PIN2	1 1/4"-7 UNC hex nut	ASTM:A194, Grade 2H	Chemical/Hardness
PIB3	1 1/2"-6 UNC x 6 1/2" long hex bolt	SAE:J429, Grade 5	Chemical/Hardness



TWIN CITY TESTING
corporation

662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601



OF: CHEMICAL ANALYSIS, TENSILE TEST, AND HARDNESS EVALUATION OF FASTENERS

4142 88-0337

DATE: January 8, 1988

LABORATORY No.

PAGE: Three

GENERAL: (cont)

Non-Safety Related Fasteners - (cont)

<u>Sample Identification</u>	<u>Sample Description</u>	<u>Material Specification</u>	<u>Testing to be Performed</u>
PIB4	1"-8 UNC x 2 3/4" long hex bolt	ASTM:A193, Grade B7	Chemical/Hardness
PIN4	1"-8 UNC hex nut	ASTM:A194, Grade 2H	Chemical/Hardness
PIB5	3/4"-10 UNC x 3 1/2" long hex bolt	ASTM:A325, Type 1	Chemical/Hardness
PIN5	3/4"-10 UNC hex nut	ASTM:A563, Grade C	Chemical/Hardness
PIB6	5/8"-11 UNC x 2" long plated hex bolt	SAE:J429, Grade 5	Chemical/Hardness
PIN6	5/8"-11 UNC plated hex nut	ASTM:A563, Grade A	Chemical/Hardness
PIB7	1/2"-13 UNC x 6" long plated hex bolt	SAE:J429, Grade 5	Chemical/Hardness
PIN7	1/2"-13 UNC plated hex nut	ASTM:A563, Grade A	Chemical/Hardness
PIB8	7/8"-9 UNC x 5" long plated hex bolt	SAE:J429, Grade 5	Chemical/Hardness
PIN8	7/8"-9 UNC plated hex nut	ASTM:A563, Grade A	Chemical/Hardness
PIB9	3/4"-10 UNC x 4" long hex bolt	SAE:J429, Grade 5	Chemical/Hardness



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GENERAL: (cont)

Non-Safety Related Fasteners - (cont)

<u>Sample Identification</u>	<u>Sample Designation</u>	<u>Material Specification</u>	<u>Testing To be Performed</u>
PIN9	3/4"-10 UNC plated hex nut	ASTM:A563, Grade A	Chemical/Hardness
PIB10	1"-8 UNC x 3" long hex bolt	SAE:J423, Grade 5	Chemical/Hardness
PIN10	1"-8 UNC hex nut	ASTM:A563, Grade A	Chemical/Hardness

The testing listed for each fastener was performed to determine conformance with their respective material specifications.

CONCLUSIONS:

The chemical analysis and tensile test results for all of the fasteners listed above conform to their respective material specifications. The hardness test results for Samples PIB1, PIB3, PIB5, and PIB10, do not conform to their respective material specifications. The hardness test results of the rest of the fasteners do conform to their respective requirements.

CHEMICAL ANALYSIS:

Safety Related Fasteners -

<u>Sample Identification</u>	<u>Total Carbon, %</u>	<u>Mangan-ese, %</u>	<u>Phos-phorus, %</u>	<u>Sul-fur, %</u>	<u>Sili-con, %</u>	<u>Chrom-ium, %</u>	<u>Nickel, %</u>	<u>Molyb-denum, %</u>
PIS1-SR	0.41	0.55	0.019	0.014	0.16	1.00	Vanadium: 0.29	0.56
PIN1-SR	0.46	-	0.022	0.010	-	-	-	-
*PID2-SR	0.38	0.90	0.013	0.025	0.17	0.90	-	0.17
PIS3-SR	0.38	0.77	0.015	0.013	0.24	1.09	-	0.15
PIN3-SR	0.42	-	0.016	0.017	-	-	-	-
PIS4-SR	0.40	0.86	0.015	0.013	0.26	0.94	-	0.15
PIN4-SR	0.42	-	0.022	0.013	-	-	-	-
PIB5-SR	0.33	-	0.018	0.021	-	-	-	-
PIN5-SR	0.06	-	0.019	-	-	-	-	-
PIB6-SR	0.30	-	0.027	0.012	-	-	-	-



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CHEMICAL ANALYSIS: (cont)

Safety Related Fasteners - (cont)

Sample Identi- fication	Total Carbon, %	Mangan- ese, %	Phos- phorus, %	Sul- fur, %	Sili- con, %	Chrom- ium, %	Nickel, %	Molyb- denum, %
PIB7-SR	0.29	0.81	0.019	0.019	-	-	-	-
PIN7-SR	0.42	-	0.011	0.012	-	-	-	-
PIB8-SR	0.32	0.75	0.020	0.021	-	-	-	-
PIN8-SR	0.42	-	0.017	0.016	-	-	-	-
PIS9-SR	0.08	0.96	0.028	0.008	0.30	18.92	8.43	-
PIN9-SR	0.06	0.81	0.039	0.019	0.76	18.53	8.18	-
PIS10-SR	0.41	0.90	0.012	0.024	0.18	0.91	-	0.21
PIN10-SR	0.41	-	0.016	0.016	-	-	-	-

*These values are the averages of the original and duplicate analyses

Non-Safety Related Fasteners -

Sample Identi- fication	Total Carbon, %	Mangan- ese, %	Phos- phorus, %	Sul- fur, %	Sili- con, %	Chrom- ium, %	Nickel, %	Molyb- denum, %
PIB1	0.34	-	0.022	0.010	-	-	-	-
PIB2	0.44	-	0.015	0.036	-	-	-	-
*PIN2	0.45	-	0.011	0.015	-	-	-	-
*PIB3	0.37	-	0.006	0.025	-	-	-	-
PIB4	0.40	0.91	0.011	0.025	0.29	1.08	-	0.17
PIN4	0.44	-	0.019	0.036	-	-	-	-
PIB5	0.39	0.84	0.010	0.019	-	-	-	-
PIN5	0.19	-	0.025	-	-	-	-	-
PIB6	0.38	-	0.016	0.023	-	-	-	-
PIN6	0.06	-	0.020	-	-	-	-	-
PIB7	0.31	-	0.008	0.014	-	-	-	-
PIN7	0.07	-	0.024	-	-	-	-	-
*PIB8	0.31	-	0.020	0.014	-	-	-	-
PIN8	0.07	-	0.029	-	-	-	-	-
PIB9	0.34	-	0.011	0.015	-	-	-	-
PIN9	0.05	-	0.018	-	-	-	-	-
PIB10	0.35	-	0.016	0.015	-	-	-	-
PIN10	0.48	-	0.015	-	-	-	-	-

*These values are the averages of the original and duplicate analyses.

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CHEMICAL ANALYSIS: (cont)

Material Specification Requirements -

Table I -

<u>Chemical Element</u>	<u>ASTM:A193, Grade B7, %</u>	<u>ASTM:A193, Grade B16, %</u>	<u>ASTM:A193, Grade B8, Cl 2, %</u>	<u>ASTM:A194, Grade 2H, %</u>	<u>ASTM:A194, Grade 8, %</u>
Total Carbon	0.37-0.49	0.36-0.47	0.08 Max	0.40 Min	0.08 Max
Manganese	0.65-1.10	0.45-0.70	2.00 Max	-	2.00 Max
Phosphorus	0.035 Max	0.035 Max	0.045 Max	0.040 Max	0.045 Max
Sulfur	0.040 Max	0.040 Max	0.030 Max	0.050 Max	0.030 Max
Silicon	0.15-0.35	0.15-0.35	1.00 Max	-	1.00 Max
Chromium	0.75-1.20	0.80-1.15	18.00-20.00	-	18.00-20.00
Nickel	-	-	8.00-10.50	-	8.00-10.50
Molybdenum	0.15-0.25	0.50-0.65	-	-	-
Vanadium	-	0.25-0.35	-	-	-

Table II -

<u>Chemical Element</u>	<u>ASTM:A325, Type 1, %</u>	<u>ASTM:A563, Grade A, %</u>	<u>ASTM:A563, Grade C, %</u>	<u>SAE:J429, Grade 5, %</u>
Total Carbon	0.25-0.58	0.58 Max	0.58 Max	0.28-0.55
Manganese	0.57 Min	-	-	-
Phosphorus	0.048 Max	0.13 Max	0.13 Max	0.048 Max
Sulfur	0.058	-	-	0.058 Max



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CHEMICAL ANALYSIS: (cont)

Calibration Values of Chemical Element Standards -

<u>NBS Standard</u>	<u>Chemical Element</u>	<u>Date Tested</u>	<u>Standard Calibration Value</u>	<u>Actual Value Obtained</u>	<u>Remarks</u>
30e	Carbon	12-15-87	0.505	0.518	Satisfactory
		12-17-87	0.505	0.508	Satisfactory
	Sulfur	12-15-87	0.036	0.035	Satisfactory
		12-17-87	0.036	0.033	Satisfactory
101e	Phosphorus	12-17-87	0.025	0.025	Satisfactory
		1-4-88	0.042	0.040	Satisfactory
	Silicon	1-4-88	0.042	0.040	Satisfactory
19g	Phosphorus	12-17-87	0.046	0.046	Satisfactory
	Manganese	12-18-87	0.554	0.558	Satisfactory
	Chromium	12-18-87	0.374	0.385	Satisfactory
	Nickel	12-18-87	0.066	0.066	Satisfactory
	Vanadium	12-18-87	0.012	0.014	Satisfactory
156	Manganese	12-18-87	1.40	1.39	Satisfactory
	Chromium	12-18-87	0.429	0.433	Satisfactory
	Nickel	12-18-87	0.475	0.478	Satisfactory
	Molybdenum	12-18-87	0.138	0.149	Satisfactory
	Manganese	1-4-88	1.40	1.41	Satisfactory
	Silicon	1-4-88	0.226	0.224	Satisfactory
	Chromium	1-4-88	0.429	0.453	Satisfactory
	Nickel	1-4-88	0.475	0.490	Satisfactory
	Molybdenum	1-4-88	0.138	0.148	Satisfactory
	65d	Carbon	12-17-87	0.264	0.268
Sulfur		12-17-87	0.010	0.010	Satisfactory
278-1	Manganese	1-4-88	0.405	0.406	Satisfactory
	Molybdenum	1-4-88	1.04	1.04	Satisfactory
	Vanadium	1-4-88	0.077	0.077	Satisfactory
101f	Chromium	12-21-87	18.49	18.37	Satisfactory
	Nickel	1-5-88	9.96	9.91	Satisfactory
13f	Carbon	12-21-87	0.629	0.625	Satisfactory
	Sulfur	12-21-87	0.016	0.014	Satisfactory
33d	Carbon	12-22-87	0.173	0.174	Satisfactory
	Sulfur	12-22-87	0.010	0.010	Satisfactory



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CHEMICAL ANALYSIS: (cont)

Calibration Values of Chemical Element Standards - (cont)

<u>NBS Standard</u>	<u>Chemical Element</u>	<u>Date Tested</u>	<u>Standard Calibration Value</u>	<u>Actual Value Obtained</u>	<u>Remarks</u>
121d	Carbon	12-22-87	0.067	0.069	Satisfactory
	Sulfur	12-22-87	0.013	0.012	
107a	Phosphorus	12-22-87	0.278	0.278	Satisfactory
130a	Phosphorus	12-31-87	0.016	0.016	Satisfactory
121d	Carbon	12-31-87	0.067	0.068	Satisfactory
	Sulfur	12-31-87	0.013	0.012	
10g	Carbon	12-31-87	0.240	0.239	Satisfactory
	Sulfur	12-31-87	0.109	0.121	Satisfactory

All of the chemical analyses conform to the chemical composition requirements of their respective material specifications.

The chemical analyses were conducted between December 15, 1987, and January 5, 1988, according to ASTM:E350 and E353.

TENSILE TEST RESULTS:

Testing of Machined Test Specimens -

<u>Sample Identification</u>	<u>Reduced-Section Area, in²</u>	<u>Yield Strength (0.2% offset), psi</u>	<u>Tensile Strength, psi</u>	<u>Elongation in 2", %</u>	<u>Reduction of Area, %</u>
PIS1-SR	0.200	133,500	145,000	19.5	60.6
PIB2-SR	0.200	**	128,500	19.5	59.8
PIS3-SR	0.199	117,300	130,900	18.5	61.8
PIS4-SR	0.199	118,300	130,400	17.5	56.2
PIS9-SR	0.0951	108,800	132,500	*32.1	71.1
PIS10-SR	0.0940	136,700	163,200	*16.4	56.6

*Elongation in 1.4", %

**Length of bolt was too short for proper extensometer fit, making the yield strength unattainable



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TENSILE TEST RESULTS: (cont)

Testing of Full Size Bolts -

<u>Sample Identification</u>	<u>Stress Area, in²</u>	<u>Proof Load Result</u>	<u>Ultimate Load, lb</u>	<u>Tensile Strength, psi</u>	<u>Location of Failure</u>
PIB5-SR	0.0775	Satisfactory	11,750	151,600	threads
PIB6-SR	0.1419	Satisfactory	19,350	136,400	threads
PIB7-SR	0.334	Satisfactory	49,750	149,000	threads
PIB8-SR	0.462	Satisfactory	57,250	123,900	*threads stripped

*Bolt length too short for proper thread engagement during testing

Material Specification Requirements -

Requirements for Machined Test Specimens -

<u>Specification</u>	<u>Yield Strength, Minimum, (0.2% offset), psi</u>	<u>Tensile Strength, Minimum, psi</u>	<u>Elongation Minimum in 2", %</u>	<u>Reduction of Area, Minimum, %</u>
ASTM:A193				
Grade B16	105,000	125,000	18.0	50.0
Grade B7	105,000	125,000	16.0	50.0
Class 2/Grade B8	100,000	125,000	12.0	35.0

Requirements for Full Size Bolts -

<u>Specification</u>	<u>Proof Load, Length Measurement Method, lb</u>	<u>Tensile Strength, Minimum, lb</u>	<u>Location of Failure</u>
ASTM:A325			
3/4"-10 UNC	28,400	*40,100	Threads
7/8"-9 UNC	39,250	*55,450	Threads



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TENSILE TEST RESULTS: (cont)

Material Specification Requirements - (cont)

Requirements for Full Size Bolts - (cont)

Specification	Proof Load, Length Measurement Method, lb	Tensile Strength, Minimum, lb	Location of Failure
SAE:J429			
Grade 5			
3/8"-16 UNC	6,600	**9,300	Threads
1/2"-13 UNC	12,100	*17,000	Threads

*Tests conducted using a 10° wedge angle
**Tests conducted using a 6° wedge angle

The tensile test result for each fastener listed above, conforms to its respective material specification requirements.

The machined test specimens were machined on December 21, 1987, according to ASTM:A370.

The tensile tests were conducted on December 23, 1987, and December 30, 1987, according to ASTM:A370, A325, F606, and SAE:J429.

The tensile tests were all performed using our Tinius Olsen Super "L" Testing Machine identified with the Serial Number 60002. This machine was calibrated July 22, 1987, due January 22, 1988. The equipment used in the calibration is traceable to NBS.

HARDNESS TEST RESULTS:

Non-Safety Related Fasteners -

Sample Identification	Test Location	Date of Test	Reading No 1	Reading No 2	Reading No 3	Reading No 4	Average Hardness
PIB1	side of bolt head	12-18-87	65.0	65.5	60.0	64.0	63.5 HR30N
PIB1	core	12-18-87	24.0	23.5	24.0	25.0	24.0 HRC
PIB2	side of bolt head	12-22-87	48.5	48.0	48.0	48.5	48.5 HR30N
PIB2	core	12-21-87	23.5	23.0	23.0	23.5	23.5 HRC
PIN2	bearing surface	12-11-87	32.0	34.0	33.5	34.0	33.5 HRC



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HARDNESS TEST RESULTS: (cont)

Non-Safety Relating Fasteners - (cont)

Sample Identification	Test Location	Date of Test	Reading No 1	Reading No 2	Reading No 3	Reading No 4	Average Hardness
PIB3	side of bolt head	12-18-87	46.0	34.5	36.0	44.0	40.0 HR30N
PIB3	core	12-18-87	97.0	95.5	96.5	96.0	96.5 HRB
PIB4	side of bolt head	12-11-87	32.0	32.0	32.0	32.0	32.0 HRC
PIN4	bearing surface	12-11-87	28.0	29.0	27.5	30.0	28.5 HRC
PIB5	side of bolt head	12-11-87	37.0	36.0	36.0	36.0	36.5 HRC
PIN5	bearing surface	12-11-87	21.5	23.0	21.5	24.0	22.5 HRC
PIB6	side of bolt head	12-18-87	49.5	49.0	48.0	48.5	49.0 HR30N
PIB6	core	12-18-87	30.5	31.0	30.5	31.5	31.0 HRC
PIN6	bearing surface	12-15-87	95.5	98.0	96.0	95.0	96.0 HRB
PIB7	side of bolt head	12-18-87	53.5	53.0	54.0	52.5	53.5 HR30N
PIB7	core	12-18-87	33.0	33.5	33.0	33.5	33.5 HRC
PIN7	bearing surface	12-15-87	93.5	96.5	92.5	95.0	94.5 HRB
PIB8	side of bolt head	12-18-87	54.0	53.0	52.5	52.5	53.0 HR30N
PIB8	core	12-18-87	32.0	30.5	31.0	31.5	31.5 HRC
PIN8	bearing surface	12-15-87	95.0	95.5	97.5	90.0	94.5 HRB
PIB9	side of bolt head	12-18-87	56.5	52.0	54.0	51.5	53.5 HR30N
PIB9	core	12-18-87	30.0	32.5	32.5	31.5	31.5 HRC
PIN9	bearing surface	12-15-87	91.0	93.0	91.5	94.5	92.5 HRB
PIB10	side of bolt head	12-18-87	54.0	53.0	50.0	52.5	52.5 HR30N
PIB10	core	12-18-87	24.5	25.5	23.5	24.0	24.5 HRC
PIN10	bearing surface	12-15-87	92.5	92.5	94.0	91.5	92.5 HRB

Safety Related Fasteners -

Sample Identification	Test Location	Date of Test	Reading No 1	Reading No 2	Reading No 3	Reading No 4	Average Hardness
PIS1-SR	core	12-17-87	31.0	32.0	32.5	31.5	32.0 HRC
PIN1-SR	bearing surface	12-15-87	29.0	29.5	29.5	29.5	29.5 HRC
PIB2-SR	side of bolt head	12-15-87	32.0	32.5	32.0	32.0	32.0 HRC
PIS3-SR	core	12-15-87	28.0	28.0	29.0	29.5	28.5 HRC
PIN3-SR	bearing surface	12-15-87	30.0	30.0	30.5	31.0	30.5 HRC



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HARDNESS TEST RESULTS: (cont)

Safety Related Fasteners - (cont)

Sample Identification	Location	Date of Test	Reading No 1	Reading No 2	Reading No 3	Reading No 4	Average Hardness
PIS4-SR	core	12-15-87	28.0	29.5	29.5	30.0	29.5 HRC
PIN4-SR	bearing surface	12-15-87	30.5	30.5	31.0	30.0	30.5 HRC
PIB5-SR	side of bolt head	12-18-87	49.5	49.5	48.5	48.5	49.0 HR30N
PIB5-SR	core	12-18-87	33.5	33.5	35.0	33.0	34.0 HRC
PIN5-SR	bearing surface	12-18-87	90.5	89.5	94.0	93.0	92.0 HRB
PIB6-SR	side of bolt head	12-18-87	52.0	51.0	51.0	50.5	51.0 HR30N
PIB6-SR	core	12-17-87	28.0	27.5	29.5	30.0	29.0 HRC
PIB7-SR	side of bolt head	12-11-87	27.5	27.5	28.5	28.5	28.0 HRC
PIN7-SR	bearing surface	12-11-87	30.5	31.5	31.5	31.0	31.0 HRC
PIB8-SR	side of bolt head	12-11-87	30.0	30.0	30.5	29.5	30.0 HRC
PIN8-SR	bearing surface	12-11-87	29.5	30.0	30.0	29.5	30.0 HRC
PIS9-SR	core	12-15-87	34.5	35.0	34.0	34.0	34.5 HRC
PIN9-SR	bearing surface	12-15-87	41.0	41.0	40.5	41.5	41.0 HRC
PIS10-SR	core	12-15-87	33.0	33.5	33.0	33.5	33.5 HRC
PIN10-SR	bearing surface	12-15-87	30.5	30.0	30.5	30.5	30.5 HRC

Material Specification Requirements -

Specification	Test Location	Hardness
ASTM:A193		
Grade B16	-	-
Grade B7	-	-
Class2/Grade B8	end of stud	35 HRC maximum
ASTM:A194		
Grade 2H	bearing surface	24-38 HRC
Grade 8, Stain Hardened	bearing surface	-
ASTM:A325		
1/2"-1"	wrench flat	24-35 HRC
1 1/8"-1 1/2"	wrench flat	19-31 HRC



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HARDNESS TEST RESULTS: (cont)

Material Specification Requirements - (cont)

<u>Specification</u>	<u>Test Location</u>	<u>Hardness</u>
ASTM:A563		
Grade A	bearing face	68 HRB-32 HRC
Grade C	bearing face	78 HRB-38 HRC
SAE:J429		
Grade 5		
1/4"-1"	hexagon flats	54 HR30N Maximum
1/4"-1"	core	25-34 HRC
Over 1"-1 1/2"	hexagon flats	50 HR30N Maximum
Over 1"-1 1/2"	core	19-30 HRC

Hardness Test Calibration Data -

<u>Date</u>	<u>Calibration Block Identification Number</u>	<u>Calibration Block Hardness Standard</u>	<u>Average Hardness Determined Prior to Testing</u>	<u>Remarks</u>
12-11-87	81-N90678	35.9 ± 1.0 HRC	35.8 HRC	Satisfactory
12-15-87	86-077966	45.7 ± 1.0 HRC	45.8 HRC	Satisfactory
12-15-87	86-T96937	42.5 ± 1.5 HRB	42.0 HRB	Satisfactory
12-15-87	86-077966	45.7 ± 1.0 HRC	45.9 HRC	Satisfactory
12-17-87	86-077966	45.7 ± 1.0 HRC	45.9 HRC	Satisfactory
12-18-87	86-077966	45.7 ± 1.0 HRC	45.8 HRC	Satisfactory
12-18-87	P70640	45.5 ± 1.0 HR30N	46.0 HR30N	Satisfactory
12-18-87	83-633166	84.6 ± 1.0 HRB	85.0 HRB	Satisfactory
12-21-87	P84254	34.8 ± 1.0 HRC	34.8 HRC	Satisfactory
12-22-87	P70640	45.5 ± 1.0 HR30N	46.2 HR30N	Satisfactory
12-22-87	P84254	34.8 ± 1.0 HRC	34.6 HRC	Satisfactory
12-29-87	69-62232	63.9 ± 1.0 HR30N	64.4 HR30N	Satisfactory
1-4-88	P84254	34.8 ± 1.0 HRC	34.8 HRC	Satisfactory
1-8-88	P70640	45.5 ± 1.0 HR30N	46.0 HR30N	Satisfactory